May 20, 1952 F. R. REDMAN 2,597,530

METHOD OF TREATING FABRIC

Filed May 1, 1950 5 Sheets-Sheet 1

FIG. 1

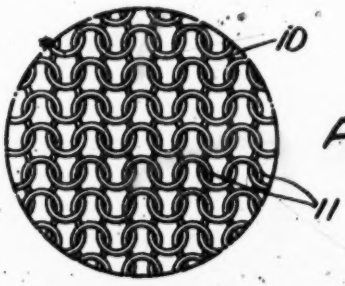



FIG. 1A

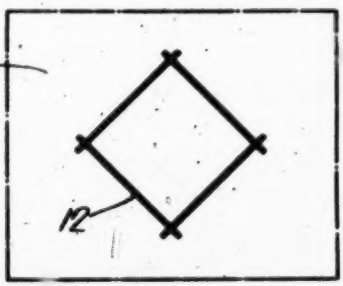



FIG. 2

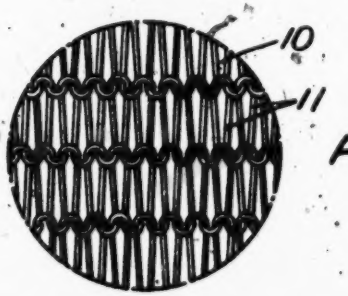



FIG. 2A

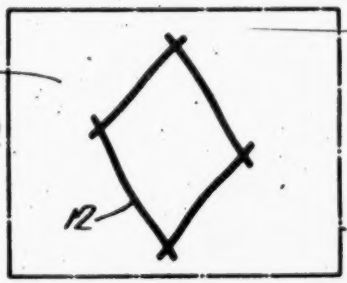



FIG. 3

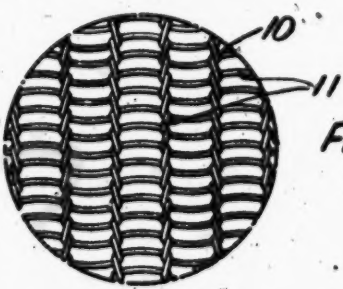



FIG. 3A

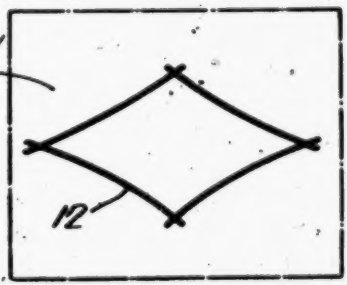



FIG. 4

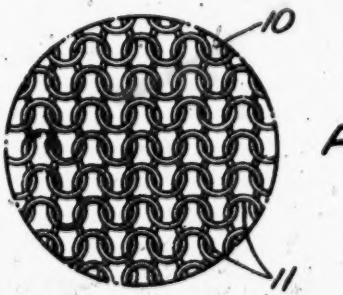
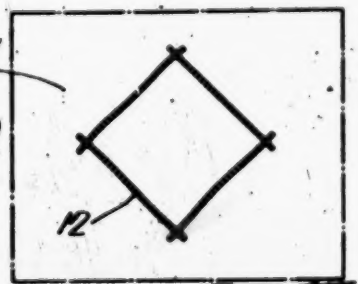



FIG. 4A




Inventor
Frank R. Redman
by his Attorneys
Howson & Howson

## Findings of Fact.

1. This is an action for infringement of two patents, No. 2,597,528 and No. 2,597,530, both issued May 20, 1952 to the plaintiff Frank R. Redman. Claims 1 to 7, inclusive, of the '528 patent and claims 1 to 3 and 5 to 13, inclusive, of the '530 patent are in suit.

2. Plaintiff Frank R. Redman (hereinafter referred to as Redman) resides at Yardley, Pennsylvania, and is the inventor and owner of the two patents in suit, and plaintiff Redman Process American Corporation, a Delaware corporation with a principal place of business in New York, New York (hereinafter referred to as RPA), has the exclusive right to grant licenses under the patents.

3. Defendant Stedman Manufacturing Company (hereinafter referred to as Stedman Co.) is a North Carolina corporation with a place of business at Ashboro, North Carolina, within this District, where the acts of asserted infringement took place.

4. The action arises under the Patent Laws of the United States and the Court has jurisdiction under 28 U. S. C. 1338(a).

5. The Complaint charges defendant Stedman Co. with infringement of the two patents in suit by reason of its use of a machine known as a "Tube-Tex Tensionless Calender" (patent '528) for reducing shrinkage in tubular knitted fabrics, and of the method employed in connection with that equipment (patent '530).

6. The Tube-Tex Tensionless Calender (hereinafter referred to as the tensionless calender) used by defendant is owned by Tubular Textile Machinery Corporation of Woodside, New York (hereinafter referred to as Tubular); the

manufacturer thereof, and is in defendant's possession under a lease agreement dated June 16, 1952.

7. One of the provisions of the aforesaid lease requires Tubular to assume the defense of any suit for infringement and to pay attorneys' fees and taxable costs provided Tubular be given exclusive control of the defense through attorneys of Tubular's own selection. Pursuant to this provision, the Stedman Co. has given Tubular exclusive charge of the defense of this action and Tubular has assumed exclusive control thereof through its own attorneys and is paying the entire cost thereof. A similar provision is included in all of Tubular's leases. The exclusive control of the defense of this action has been assumed by Tubular to protect its own rights in the leasing of its tensionless calenders in the industry.

8. The patents in suit are directed to an apparatus (patent '528) and to a method (patent '530) for reducing the shrinkage in tubular knitted fabrics when laundered. Such fabrics are used in the manufacture of various types of garments, such as T-shirts, briefs, athletic undershirts, children's sleepers, and outerwear, for example, polo shirts.

9. When tubular knitted fabrics are stretched in length, they tend to become narrow in width and when expanded in width, they tend to become shorter in length. This is an inherent characteristic of such fabrics which is due to the construction of the fabric stitches and is well recognized by the industry. After tubular fabric is knitted, it is subjected to several wet processing steps including scouring, bleaching, dyeing, and extraction. In these wet processing steps, the fabric is pulled longitudinally and "the stitches are distorted from the shape they had after knitting and the fabric as a whole is distorted accordingly, being stretched longitudinally and narrowed transversely or widthwise" (patent '530, col. 2, ls. 12-15). The stitches of

the finished fabric are set in a distorted condition, and excessive lengthwise shrinkage results because, upon laundering, the stitches, and consequently the fabric as a whole, return substantially to the untensioned (relaxed) condition that existed following the knitting of the fabric.

10. For many years prior to the inventions of the patents in suit, excessive lengthwise shrinkage of garments made from tubular knit fabrics was recognized as a very serious problem by the industry. In spite of many efforts over the years to solve it, the problem still existed, as is shown by the experience of Munsingwear, Inc., one of the largest producers of knit garments in the country; by the experience of the U. S. Quartermaster Corps and of the industry at large through the sponsorship of the Redman Trust by the Underwear Institute, a trade organization including in its membership the majority of the manufacturers of knitted underwear in the United States; by the experience of Tubular; by the experience of the Stedman Co.; and by the experience of the Redman licensees.

11. As the use of a tensionless calender leased by Tubular to the Stedman Co. is in issue, the experience of Tubular is particularly significant. In 1939, Tubular attempted to solve the lengthwise shrinkage problem by constructing two experimental "pre-shrinking" machines, one of which was retained at the plant and the other of which was first leased to Globe Knitting and then to Munsingwear. The machines did not perform satisfactorily and were never used commercially. The problem remained unsolved by Tubular until its development of the tensionless calender, after it was fully familiar with the details of Redman's apparatus and method. In patents Nos. 2,589,344 and 2,589,345 issued in 1952, directed to the tensionless calender, it is stated that the provision of a tubular knit fabric which will not be subject to substantial shrinkage upon laundering "has long been considered desirable but

heretofore has not been obtainable in the treatment of tubular textile fabrics", and "This object has been needed in the industry but never heretofore obtainable".

12. The cause of excessive lengthwise shrinkage of Tubular knit garments had long been known but despite this, no solution of the problem was forthcoming. As early as 1938 or 1939, Munsingwear had made a study of the matter and had determined that this shrinkage was due to the elongation of the fabric, with consequent distortion of the stitches, caused by the wet processing steps, and the return of the stitches and fabric upon laundering substantially to the unstretched or equilibrium condition which existed following knitting and before wet processing. The same conclusion had been reached by the Quartermaster Corps and a report so stating was distributed in May 1947 which summarized the situation as follows: "However, even though all of the causes for lack of stability have been analyzed, qualitively and quantitatively, and their effects plotted and charted, the Army is still purchasing knit goods that shrink 15 to 20 percent in the first wash".

13. By Redman's inventions of the patents in suit, the excessive lengthwise shrinkage of garments made from such fabrics, which had plagued the industry for years, is eliminated. As contrasted to the prior garments which shrank to such an extent upon laundering that they would no longer fit, Redman made it possible, for the first time, for the industry to market a garment that is shrink-resistant and to guarantee that such a garment "will not shrink out of fit". The licensees of Redman and the lessees of Tubular now are selling their garments using these or equivalent representations and guarantees. Such a shrink-resistant garment is a product new in the industry and is the product that the industry had long been seeking. Referring to the experience of the Stedman Co., as typical, the lengthwise shrinkage of its garments has been reduced

from 11-13% to about 3% or less (line dried) by the use of the tensionless calender.

14. The apparatus of '528 has become known as "a normalizer" and the method of the '530 patent as "normalizing". These terms are used because by the use of the apparatus and method, the fabric itself and the stitches in the fabric, which had been distorted lengthwise and narrowed widthwise by the stretching during processing, are returned substantially to the condition in which they existed following the knitting and prior to processing. By repositioning the stitches substantially to their original knitted form and restoration of the fabric substantially to its normal condition, the excessive lengthwise shrinkage present in the conventionally processed fabrics is substantially eliminated.

15. In the use of the apparatus and method of the patents in suit, tubular knit fabric, which has been elongated lengthwise and narrowed widthwise due to processing, is expanded widthwise while it is free to shorten or condense lengthwise and is thereafter permitted to relax, both lengthwise and widthwise, whereby to effect repositioning of the fabric stitches substantially to their original knitted form and restoration of the fabric substantially to its normal condition. In any particular case, the fabric is expanded widthwise sufficiently while it is free to shorten or condense lengthwise so that, after relaxation, the fabric will be "normalized", that is, returned substantially to the unstretched condition which prevailed immediately following the knitting of the fabric and prior to the processing thereof.

16. This solution escaped the various investigators and experimenters in the industry. It was not obvious to the men skilled in the art. The Munsingwear research men, for example, knew from microphotographs that the stitches,

in the fabric after knitting and before wet processing, had the form illustrated in Fig. 1 of the '530 patent, that after wet processing they had the form shown in Fig. 2, and that after laundering, they returned substantially to their original form as shown in Fig. 1. Notwithstanding this, they had no conception that the problem of excessive shrinkage could be eliminated by expanding the fabric widthwise while it was free to shorten or condense lengthwise (as illustrated in Fig. 3) and thereafter permitting the fabric to relax, to cause the stitches to take the form illustrated in Fig. 4.

17. Redman first became interested in the shrinkage problem in 1938, and at that time developed the apparatus and process of his earlier patents, which were originally the basis for the Redman Trust sponsored by the Underwear Institute. From time to time, beginning in 1944 and until he had equipment available which he could convert into a normalizer in the early winter of 1948, Redman "hand normalized" dry fabric. This work and the sketches made between 1946 and 1948 show that Redman had a full understanding of the principle of normalizing.

18. In 1946, the Trustees of the Redman Trust ordered an experimental machine from Proctor & Schwartz, Inc. This was delivered and installed late in 1947, and placed in operation in January 1948. Redman changed the construction and location of the spreader furnished with the equipment so that normalizing could be accomplished. The normalizer and normalizing method were demonstrated to a large representation of the industry at an Open House held on April 29, 1948. While Tubular had no representatives at the Open House, shortly thereafter Tubular received from one of its customers who was present a detailed disclosure of Redman's normalizing apparatus and method.

19. The Redman Trust granted licenses between December 1948 and its dissolution in December of 1950. A few licenses were granted by Redman while he was operating as an individual and licenses have been granted by RPA following agreement with Redman in December 1952. At the present time, there are twenty-five licenses in force, including licenses held by such well-known leaders in the industry as Perry Knitting Mills, Allen Knitting Co., Beaunit Mills, Spring City Bleach & Dye Works, and Pottsville Bleaching & Dyeing Co. The testimony of executives of licensed companies establishes that the problem of excessive lengthwise shrinkage has been solved by the patents in suit.

20. Because of the competition provided by the introduction of the tensionless calender, the Underwear Institute withdrew its sponsorship of the Redman Trust, and it was during the period when Redman was struggling along trying as an individual to introduce the inventions in the industry that Tubular became entrenched in the field with its tensionless calender.

21. Each patent in suit gives an example in which the tubular knitted fabric is spread or expanded to the circumference of the knitting machine head or one and one-half times the head diameter of the knitting machine. The example given in the patents has been found generally applicable to give satisfactory results. It has also been found to be a good starting place from which to determine the proper width to which the tubular fabric should be expanded so that, upon relaxation, it will return to the normal condition thereof after knitting and prior to processing. In practice, the width to which the tubular knitted fabric is spread or expanded in any particular case depends upon the type of fabric being processed, the knitting construction or type of stitch employed, the weight of the yarn, the processing to which the fabric may

have been subjected, and also the desire of the user to obtain optimum results.

22. The claims in suit of both patents are directed, respectively, to the apparatus and process for accomplishing normalizing and do not require that the fabric be expanded widthwise to any particular numerical amount and are not limited to the treatment of "wet" or "dry" fabric.

23. Defendant's infringing use of its tensionless calender is established by its operations of that equipment in producing the Presnell, Worthington, and Lawson samples of fabric as described by witnesses at the trial and shown by the charts, Pls' Exs. 28A, 29A, and 31. The tensionless calender at the plant of the Stedman Co. as it was employed to process the Presnell and Worthington samples, as well as the Lawson samples, constituted a normalizer as described and claimed in the '528 patent in suit and the method employed in processing these samples at the Stedman plant constituted a normalizing operation under the claims of the '530 patent in suit.

24. Taking claim 1 of the '528 patent as typical, the accused tensionless calender has means (belts) for moving the tubular knitted fabric lengthwise through a treatment zone while affording lengthwise freedom of the fabric. In the tensionless calender, the frame and pulleys of the propeller are within the treatment zone and operate to internally expand or spread the tubular fabric widthwise to effect lengthwise shortening or condensing of the fabric. And the finishing rolls and roll-up roll are fabric handling means which permit the fabric to relax. The belts, propeller frame and pulleys, and finishing roll-up rolls cooperate to internally expand the tubular fabric and shorten or condense it lengthwise as it moves through the treatment zone with lengthwise free-

dom and then to permit it to relax, whereby the fabric stitches are repositioned substantially to their original knitted form and the fabric is restored substantially to its normal condition.

25. Referring to claim 1 of patent '530 as typical, in the operation of the tensionless calender, the belts operate to move the tubular knitted fabric lengthwise through a treatment zone while providing lengthwise freedom of the fabric. In passing through the treatment zone of the tensionless calender, the fabric is expanded widthwise by the frame and pulleys of the propeller which was set sufficiently wider than the width of the entering processed fabric to effect lengthwise shortening or condensing of the fabric. After the tubular knitted fabric has thus been expanded widthwise, the finishing rolls and roll-up roll operate to permit the tubular knitted fabric to relax both in width and length. In the operation of the tensionless calender, these steps of moving the fabric widthwise through a treatment zone with lengthwise freedom, internally expanding it sufficiently to shorten and condense the fabric, and then permitting the fabric to relax, combine and cooperate to reposition the stitches substantially to their original knitted form and restore the fabric substantially to its normal condition.

26. There is substantial identity of both the construction and operation of the tensionless calender with the normalizer and its operation as shown and described in the '528 and '530 patents. Both the tensionless calender and the machines of the two patents in suit have correspondingly functioning means for moving tubular knitted fabric lengthwise to and through a treatment zone while it is free lengthwise to shorten or condense. In the tensionless calender, as operated by the Stedman Co. as in the two patents in suit, there is a treatment zone or expansion station within which there is an expanding de-

vice which operates to internally expand the tubular fabric widthwise to effect lengthwise shortening or condensing of the fabric. In the tensionless calender just as described in the two patents in suit, means in the form of finishing and wind-up rolls are provided which are constructed and function to permit the fabric to relax and seek its own equilibrium, thereby repositioning the stitches of the fabric to their original knitted form and restoring the fabric to its normal condition.

27. Redman's advance in the art has been a real and valuable one which provided a staple solution to a problem that had long harassed the industry.

28. In defendant's operation of its Grand Rapids machine prior to acquiring the tensionless calender, the tubular fabric was spread widthwise and then set substantially at the spread width. In subsequent handling, the spread and set fabric was tensioned and pulled lengthwise so that it was elongated and narrowed widthwise bringing it down to the desired finished width at the cutting table. The fabric had not been "normalized" but to the contrary contained set-in tensions as evidenced by the high shrinkage when washed of from 11-13 percent (line dried) after washing as compared to a residual shrinkage of from 1 to 4 percent in the same tubular fabric finished on the tensionless calender.

29. It is not possible to condense the stitches of tubular knit cotton fabric by pushing the fabric lengthwise. In the operation of defendant's tensionless calender, the overfeeding of the fabric onto the second set of belts forms pleats or ripples of the fabric without any condensing of the individual stitches of the fabric. As soon as the fabric leaves the control of the machine the pleats or ripples move out without leaving any permanent effect upon the fabric.

30. By its use of the tensionless calender, the defendant Stedman Co. has infringed claims 1 to 7, inclusive, of the Redman '528 patent.

31. By its use of the tensionless calender, the defendant Stedman Co. has infringed claims 1 to 3 and 5 to 13, inclusive, of the Redman '530 patent.

32. Defendant by its Answer and by notice pursuant to Section 282, Title 35 U. S. C., has set up a total of some 31 United States and foreign patents and printed publications, together with some five or six alleged prior uses, which are alleged to show anticipation or lack of invention in the subject-matter of the two Redman patents in suit.

33. In none of the prior art is there a disclosure of Redman's normalizer apparatus or the normalizing method.

34. The Cohn et al. patent No. 2,228,001 is the standard Tube-Tex straightline calender and finisher which has been used by the tubular textile industry for many years. Also urged as alleged prior uses is the use of similar machines by the Tubize Chatillion Corporation (Weisler), Signal Knitting Mills (Murphey), and Munsingwear (Anderson). As stated in this Cohn et al. patent, the subject-matter relates to apparatus for finishing tubular knit goods to a specified width with a specified yield by accurate adjustment of the relationship between transverse and longitudinal tension in accordance with known commercial practice. The pressure or finishing rolls 21 of this Cohn et al. patent operate to press and set the cloth at the width to which it was expanded by the spreader and the term "shrinkage" where used in the specification has reference to mill shrinkage with which the mill operation is concerned in obtaining yield and does not refer to the wash or laundering shrinkage of garments made from such fabrics. In another Cohn et al. patent No. 2,589,344, directed to the tensionless

calender, it is stated, referring to such standard practice, "Because of the longitudinal tension which is maintained throughout the steam treatment no shrinkage is permitted, and consequently the fabric is subject to shrinkage when laundered." Operation of machines of Cohn et al. '001 patent in the manner described therein precluded relaxation of the fabric so that the stitches thereof were not repositioned substantially to their original knitted form and the fabric was not restored substantially to its normal condition.

35. The later Cohn et al. patent No. 2,589,344 shows and describes the tensionless calender having mechanism for folding the tubular fabric. The application for this Cohn et al. patent '344 was filed some fourteen months after the application for the '528 patent in suit and, therefore, the Cohn et al. patent '344 is not a reference against the '528 patent. It is also not a reference against the '530 patent in suit. The '530 patent is a division and continuation-in-part of the original application for the '528 patent. All of the subject-matter relating to method which is disclosed in the original application for the '528 patent is included in the disclosure of the '530 patent, and claims 1, 3 and 7 to 11, inclusive, of the '530 patent find full response in the teaching contained in the original application for the '528 patent.

36. The Bates Patent No. 1,789,093 of 1931 is for a machine for drying and finishing tubular textile fabrics. The apparatus comprises a tenter frame or spreader mounted above a cartridge 1 which discharges the hot air through a nozzle 4 to the inside of the tubular fabric as the fabric passes over the spreader so that the fabric is stretched widthwise and dried at the same time. As the stretched and dried tubular fabric leaves the spreader, it passes through finishing rolls 33, 36 and is rolled up on removable roll 47 inserted in slots 48 in the side frames

of the machine. The Bates patent teaches nothing about shrinkage or how the Bates apparatus might possibly be used to reduce the residual wash shrinkage in tubular knitted fabrics which have been stretched and elongated lengthwise and narrowed widthwise by wet processing. In the Bates patent, there is no teaching of any means or method of internally expanding tubular knitted fabric widthwise to effect lengthwise shortening or condensing of the fabric, no teaching of relaxation of the fabric, and no teaching of repositioning the stitches substantially to their original knitted form and restoring the fabric to its normal condition. To the contrary, by stretching the tubular fabric and drying the fabric while it is held out in stretched position as the Bates patent states, the tubular knitted fabric is set in the stretched condition thereof and, therefore, cannot relax.

37. The Murphy Patent No. 941,164 (1909) is a machine for turning and winding tubular fabrics. The apparatus of this patent comprises a turning tube 2 which is an old and well-known instrument in the tubular textile fabric field for turning inside out a long length of tubular fabric. As stated in the patent, the size of the spreader 14 corresponds with the particular size of the tubular knitted fabric being processed. The tubular fabric is not expanded widthwise beyond its flat width so that there is no lengthwise shortening or condensing of the fabric, and hence no relaxation of the fabric.

38. The Harder Patent No. 448,817 (1891) is an early recognition of the cause of lengthwise shrinkage in tubular knitted fabrics and discloses an unsuccessful attempt to solve that problem. In Harder, the tubular knitted fabric in dry condition is drawn upwardly over a spreader by a roll $B_2$ and is wound-up on a roll B. As the tubular knitted fabric passes over the spreader, it is dampened by steam discharged internally of the tubular fabric. The dampened

fabric is expanded and stretched widthwise and is held in such expanded position by the guide $A_2$ until the fabric reaches the feed roll $B_2$ so that it is wound on the take-up roll B in its stretched and dampened condition and is allowed to remain in the roll until dry. In Harder's arrangement, there can be no relaxation of the fabric. The tubular knitted fabric is wound up in its dampened and stretched condition and is held in that condition in the roll while it is drying so that it is set to width and there is no chance for the fabric to relax. This is borne out by the experience of Proctor & Schwartz, Inc., with respect to the experimental normalizer shown in Defendant's Exhibits 75, 75-A. The Proctor & Schwartz machine had a roll-up arrangement substantially identical to both Harder and Bates and this was not successful because the tubular fabric was not afforded an opportunity to relax.

39. The German Patent No. 297,240 of 1915 to Jahreis relates to a spreading and stretching mechanism for woven tubular Tricot goods and the purpose of the device is to stretch to a desired length and width Tricot goods which have been shrunk due to washing, conditioning, centrifuging, etc. prior to calendering and beaming them. The patent is concerned with "yield" of the fabric; that is a definite width and length for a given weight of fabric. According to this patent, means is provided for automatically controlling the feed of the fabric in response to variations or fluctuations in tension in the fabric. The patented machine incorporates both a widthwise tensioning means in the form of a spreader and a separate lengthwise tensioning mechanism, the objective of the patent being accomplished by a proper coordination of these two tensioning means to give the desired fabric yield. The patent does not contemplate use of the machine without the lengthwise tensioning means. This German patent is not concerned with reduction of wash shrinkage in tubular knitted fabric. To the contrary, the fabric is tensioned lengthwise while

it is spread widthwise in order to produce the desired "yield." There is no internal expansion of the fabric while it is free to come up lengthwise to effect lengthwise shortening or condensing of the fabric, and there is no relaxation of the fabric.

40. The German Patent to Gessner No. 689,671 of 1940 is primarily concerned with the provision of a pre-tensioner of particular construction in front of a spreader which is employed to spread and stretch tubular fabric to the required size. The pre-tensioner, a round semi-spherical body 13, is positioned ahead of the spreader frame 7 and operates to extend the tubular fabric uniformly in all directions and feed it to the spreader frame 7 with a certain pre-tension. After the tubular fabric passes over the spreader frame 7 it passes between the feed rolls 4 and is wound up as indicated at 8. The Gessner German patent says nothing about use of the apparatus for the reduction of shrinkage in tubular knit fabrics. The roll-up in this German Gessner patent is the same functionally and structurally as the roll-up in the Bates and Harder patents and does not permit relaxation of the tubular knitted fabric as it came off the spreader. The German Gessner patent does not disclose the internal expansion of tubular knitted fabric while it is free lengthwise to shorten or condense the fabric lengthwise and does not teach the relaxation of the tubular knitted fabric after it has been expanded widthwise to shorten or condense it lengthwise.

41. The German Patent of Weisbach No. 655,338 (1938) relates to a method for stretching and drying tubular fabrics by a device commonly known in the art as a suction cylinder drier. The stated objective and purpose of the patented apparatus is to spread the fabric to a required width and then hold it in its spread condition by means of a blanket during drying. The cylinder or drum 1 is perforated and as the drum 1 rotates the tubular knitted fabric

is held against the surface of the drum by the belt or follower 2 and is dried by means of hot air which is drawn through the belt and fabric by means of a suction fan. The stated purpose of the holding belt or follower 2 is to hold the fabric against the cylinder and assist the suction in preventing shrinking of the tubular knitted fabric during the drying operation on the cylinder of the machine. During drying on the cylinder, the fabric is not free to relax and reposition the stitches of the fabric substantially to their original knitted form and restore the fabric substantially to its normal condition. The shrinkage referred to in the Weisbach German patent has reference to mill shrinkage or yield—not laundry or wash shrinkage.

42. The German Patent of Conzelman No. 742,075 of 1943 relates to a stretching mechanism for wet tubular woven and knitted fabrics. The patent is particularly concerned with the construction and arrangement of a so-called pre-tensioner device which is mounted ahead of the spreader. The tubular knitted fabric is drawn upwardly over the pre-tensioner and spreader by means of driving rolls 7 and upper guide rolls 8 and 9. The patent discloses no variable speed relationship between the rolls 7, 7 and the upper guide rolls 8, 9 so that the fabric is stretched in length at the same time that it is spread in width. The fabric is not permitted to relax and there is no repositioning of the stitches or restoration of the fabric to its normal condition as taught by the patents in suit.

43. The Hunt British Patent No. 212,369 of 1924 relates to apparatus for stretching and finishing tubular fabrics wherein the tubular fabric is expanded to the required width and then passed through calendering rolls which press and set the fabric in its expanded form. Since the calendering rolls press the fabric and set it to its expanded width, the fabric cannot relax, and this British patent does not disclose any means or method capable of

repositioning the stitches of the fabric substantially to their original knitted form and restoring the fabric substantially to its normal condition.

44. The Hunt British Patent No. 159,335 of 1921 has for its object the provision of a novel arrangement for supplying steam for dampening the tubular knitted fabric being processed on apparatus such as that shown and described in an earlier British patent No. 122,603. In this earlier patent, the tubular fabric is expanded widthwise and pressed and set to its expanded width so that it is held out in width and does not relax. This is the case also with respect to the British patent No. 15,957 of 1908 which relates to the wide stretching of tubular fabrics and the immediate winding up of the tubular fabric so that it is held and set to the wide stretched width thereof.

45. The French Patent No. 786,426 of 1935 is a combination of a tenter or spreader and cylinder drier or calender especially designed and adapted for shrinking fabrics in flat open form and not in the tubular form of the two Redman patents in suit. In this French patent, there is no spreader for internally expanding knitted fabric in *tubular* form and it does not appear from the patent that it has anything to do with the subject-matter of the two Redman patents in suit. The patent points out that lengthwise shrinkage of flat or open fabric is accomplished by the tentering frame and that widthwise shrinkage of the fabric is accomplished on the endless belt cylinder. According to the patent, the selvage edges of the open or flat fabric are grasped and carried along by the divergent wheels of the tenter frame which function to spread the flat fabric widthwise. The fabric then is delivered by the tenter wheels between a pair of belts which carry the fabric to the calender cylinder. The fabric is overfed to the calender cylinder in the form of undulations or pleats in which condition it is held by a continuous belt or blanket

against the rotating calender cylinder. The two-stage operation of this French patent in connection with *open* or flat fabrics (not tubular fabrics) wherein lengthwise shrinkage is accomplished in a first stage on the Palmer-type tenter wheels and widthwise shrinkage accomplished in a second stage with the fabric in rippled or pleated form on the calender cylinder, does not teach Redman's invention of the two patents in suit in which the fabric in *tubular* form is internally expanded widthwise and then given complete freedom to relax and seek its own equilibrium, whereby to reposition the stitches of the fabric substantially to their original knitted form and restore the fabric susbtantially to its normal condition.

46. Textile Series Report No. 57 of the Office of the Quartermaster General is a report of studies made in the field of shrinkage in garments made from tubular knitted fabrics. The study was based on the work of the Underwear Institute and the Redman Trust and the section on Pre-Shrinking, pages 18 and 19, is a summary of Redman's work at Spring City Bleach and Dye Works in the development of the inventions of the two Redman patents here in suit. This report is dated June 1949 which is much later in time than Redman's date of invention, as well as the filing date of October 22, 1948 of the application for the '528 patent in suit, of which the '530 patent in suit is a division and continuation-in-part. It is not a good reference against the two patents in suit.

47. The Rayon and Synthetic Yarn Handbook dated 1934 describes the Tube-Tex wet processor or extractor (see Finding No. 53), and page 303 shows a dryer of the type shown in the Bates patent (Finding No. 36), the entire system being operated as stated at page 304 so that "'yield' is controlled and all moire is eliminated". There is no disclosure in this publication similar to Redman's apparatus and method for internally expanding tubular

knit fabric widthwise while it is free to shorten and condense lengthwise followed by freedom of the fabric to relax and reposition the stitches substantially to their original knitted form and restore the fabric substantially to its normal condition.

48. The publication "Silk and Rayon" of 1946 discloses a calender for tubular rayon fabric finishing in which the tubular fabric is spread wide and then set or ironed at the spread width. As stated on the second page of the publication "the fabric is pressed whilst hot and moist (it is previously dampened to a suitable degree) and it is thus set as regards its dimensions and the smoothest of its surface". No opportunity is afforded the fabric to relax.

49. "Textile World", for December 1941, is an editorial answer to a question raised with respect to shrinkage in knitted rayons, and merely expresses the opinion that the shrinkage in length of these fabrics is due to their not having been spread wide enough in the calendering operation. The publication contains no disclosure or teaching of how wide the fabric should be spread to substantially reduce the shrinkage, much less is there any teaching that the tubular knitted fabric should be expanded widthwise sufficiently to effect lengthwise shortening or condensing of the fabric and then be permitted to relax according to the inventions of the two Redman patents in suit.

50. The Quillitsch [sic] articles (Def's Exs. 54D, E, and F) consist of a series of articles which contain a number of tables for spreading different types of tubular knitted fabrics in accordance with standard commercial finishing practice. The spreader widths given in the tables are very small—in most instances, less than the diameter of the knitting machine head. Defendant's expert, Lawson, testified that the spreader widths are too narrow to give the desired results.

51. The publication "Trends in Knit Goods" by Walmsley, dated January 1949, is subsequent to Redman's date of invention and the filing date of the '528 patent in suit, of which the '530 patent in suit is a division and continuation-in-part. This publication shows and describes a typical suction cylinder drier of a construction and operation similar to the Weisbach German patent (Finding No. 41).

52. The publications of the "Grand Rapids Textile Machinery Company" show and describe standard type finishing equipment used by the tubular textile industry for many years. In the operation and construction of the machine shown and described in Def's Ex. 55 (1928) live steam dampens the fabric and the heated rolls iron out the wrinkles, set the stitch and effect the finish. There is no teaching of spreading the fabric widthwise to shorten or condense it lengthwise, and the fact that the machine irons and sets the stitches of the fabric as stated, precludes any relaxation of the fabric. Def's Ex. 55A published in 1925 shows simply a number of forms of spreader devices. It teaches nothing with respect to reducing the shrinkage in tubular knit fabrics must less anything relevant to the apparatus and method of the two Redman patents in suit. The Circular 828 entitled "The Shields System" (Def's Ex. 55B) published in 1925 illustrates and describes the Shields upright steaming and rolling machine. This is a machine similar in construction and operation to the Harder U. S. patent (Finding No. 38). In the operation of this machine, the tubular knitted fabric is steamed to dampen it as it passes over the spreader which expands the fabric to the desired width and the expanded fabric is then rolled up in stretched or expanded condition so that there is no possibility of relaxation. Def's Ex. 55C, of 1925, shows and describes a conventional turning and loading machine which has been employed in the tubular textile industry for many years for turning inside-out a long

length of tubular knitted fabric. This has no relevancy to the subject-matter of the two Redman patents in suit. Def's Exs. 55D, E, and G, published in 1934, illustrate and describe the well-known commercial practice of spreading wet tubular knitted fabric widthwise, for example, 3 to 5 inches larger than the knitting machine head as stated in the publication, and then rolling the fabric up while it is held to its stretched width so that it cannot relax. The Grand Rapids publications (Def's Exs. F and G) published respectively in 1928 and 1925, disclose the standard commercial finishing practice. There is no teaching in these particular publications of the concept of substantial widthwise expansion of tubular knitted fabric followed by release of the fabric to permit it to relax both widthwise and lengthwise and thereby seek its own equilibrium. To the contrary, these publications specifically state that the tubular fabric is spread simply to open it up to the same condition from which it came from the knitting machine free from tension, that is to the width of the griege fabric in relaxed condition after it comes off the knitting machine. This is insufficient to effect lengthwise shortening or condensing of the fabric so that upon relaxation of the fabric the stitches thereof will be repositioned substantially to the original form and the fabric will be restored substantially to its normal condition. The circular entitled "Universal Calender and Folder" (Def's Ex. 55J) published prior to 1935 shows and describes the same equipment as Def's Ex. 55, and has nothing to do with spreading tubular fabric to normalize and then relax it.

53. The alleged prior use of the Tube-Tex Wet Extractor or Processor by Signal Knitting, Munsingwear, Beaunit, and others does not show lack of invention of the two Redman patents in suit. In the Tube-Tex Wet Processor or Extractor wet tubular knit fabric is drawn over a spreader and passes between a first set of squeeze rolls which wring as much moisture as possible from the wet

fabric. The first set of squeeze rolls tends to set the fabric at the width to which it was spread. The fabric then is treated with processing liquid and passed through a second set of squeeze rolls which wring from the fabric the excess processing material and again set the fabric. The prior commercial use in the industry of the Tube-Tex Wet Extractor or Processor did not employ or teach Redman's concept of spreading tubular knitted fabric widthwise to shorten or condense it lengthwise and then permitting the fabric to relax and seek its own equilibrium thereby to reposition the stitches and restore the fabric substantially to its normal condition.

54. The first tensionless calender constructed by Tubular was a sample machine which was retained by Tubular for demonstration purposes. In April 1949, this machine was demonstrated to Dunmore of Utica and King of Munsingwear, and photographs of the machine were exhibited to others at the Knitting Arts Exhibition at Atlantic City at the end of April 1949. Tubular did not propose to lease or sell the demonstration machine. It was definitely not for sale or lease. At that time, the demonstration machine was the only such machine in existence and no machines were in stock ready for delivery. The first machine built for "sale" was built after the receipt by Tubular of an order from Utica on May 29, 1949.

55. The Tube-Tex experimental pre-shrinking machine was not successful and was abandoned. It taught nothing with respect to the inventions of the two patents in suit. The fabric was fed to the experimental machine in flattened tubular form at approximately the width of the spreader which had parallel sides and did not operate to expand the fabric widthwise to shorten and condense it lengthwise. From the spreader, the fabric passed between calender rolls which set the fabric at the spreader width so that fabric could not relax and seek its own equilibrium.

56. None of the prior patents, publications, and alleged prior uses discloses or embodies the Redman inventions of the two patents in suit. Defendant has failed to establish that the apparatus and method of the patents in suit were obvious, at the time the inventions were made, to a person skilled in the treatment of tubular knit goods. The Redman inventions were not anticipated and were a valuable innovation requiring invention beyond the ordinary skill of the art.

## Conclusions of Law.

1. The Court has jurisdiction of the subject-matter of this action and of the parties hereto.

2. The Redman patent No. 2,597,530 is entitled to the filing date of the original application for the Redman patent No. 2,597,528 as to claims 1 to 3 and 7 to 11, inclusive, of said Patent No. 2,597,530.

3. The tensionless calender of Tubular Textile Machinery Corporation, Woodside, Long Island, New York, was not on sale prior to May 1, 1949, or more than one year prior to the filing of the application for the Redman patent No. 2,597,530 on May 1, 1950.

4. The Redman patent No. 2,597,528 is good and valid in law.

5. The Redman patent No. 2,597,530 is good and valid in law.

6. The defendant, Stedman Manufacturing Company, has infringed claims 1 to 7, inclusive, of patent No. 2,597,528 and claims 1 to 3 and 5 to 13, inclusive, of patent No. 2,597,530 by the use within this District of a tensionless calendar manufactured and leased to defendant by Tubular Textile Machinery Corporation of Woodside, Long Island, New York.

7. The determinations of validity of the two Redman patents in suit and infringement thereof are effective and binding upon the defendant, Stedman Manufacturing Company, and upon the manufacturer and lessor of the equipment, Tubular Textile Machinery Corporation.

8. Judgment may be entered awarding plaintiffs damages and costs and ordering an accounting to ascertain and determine the amount of damages.

9. That a permanent injunction shall issue under the seal of this Court directed to the defendant, Stedman Manufacturing Company, and to Tubular Textile Machinery Corporation, and to each of them, enjoining each of them and their officers, agents, representatives, employees, and attorneys, and all those in privity and participation with them, and each of them, from infringing said patents Nos. 2,597,528 and 2,597,530, or either of them, during the life of said patents, respectively.